



U.S. Department  
of Transportation

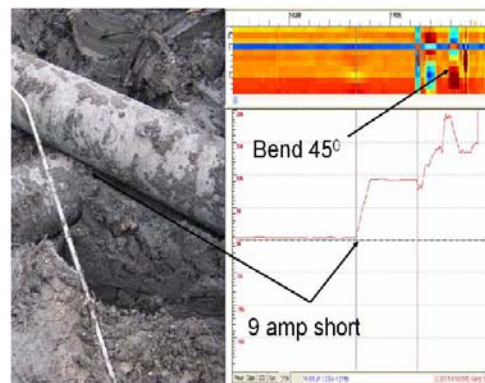
# Cathodic Protection Current Mapping In-Line Inspection Technology

## OPS ACCOMPLISHMENTS

### Pipeline Safety Research and Development for In-Line Inspection and Cathodic Pro- tection

### Challenge

Pipelines with rights-of-way in areas difficult to access present unique problems for pipeline operators when monitoring cathodic protection systems and their effectiveness in protecting the pipeline from external corrosion. Traditional spot-check potential surveys and more detailed close interval surveys are time consuming, expensive, and often leave gaps in the data. The pipeline industry has a need for an in-line inspection tool that can quickly and accurately evaluate a cathodic protection system's effectiveness from inside the pipeline. An in-line tool has been developed that quickly and accurately records the magnitude and direction of cathodic protection current flowing in the pipe wall. This allows pipeline operators to determine if their pipeline is receiving current along its entirety and is thus protected from external corrosion threats.



CPCM™ tool and data showing  
electrical short to another pipeline

### Technology Description

The CPCM™ Cathodic Protection In-Line Inspection Tool has been developed to continuously measure the magnitude and direction of cathodic protection current traveling in a buried or submerged pipeline while traversing the inside of the pipe. Data is gathered as the CPCM tool makes contact with the pipe wall as it travels through the pipeline and measures the voltage drop caused by the flow of CP current traveling back to the current source. Current sources, changes in current density, shorts, and bonds are easily located and quantified. AC and DC voltage drops are recorded in the same inspection and an on-board caliper makes integration with other data sets seamless.

### Accomplishments

After Shell Global Solutions proved that this technology was feasible, they entered into a joint development / license agreement with Baker Hughes Pipeline Management Group to develop a 12" prototype tool and commercialize the CPCM inspection service. The first patent was awarded in 2006, and field trials continued through 2007. The first commercial CPCM tool was introduced at NACE 2008 in New Orleans with great interest expressed by industry. A full fleet of CPCM tools is presently in operation with size capabilities from 8" to 24". Baker Hughes has inspected several hundred miles of pipe with these tools and continues to improve the technology.

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# Office of Pipeline Safety

## Pipeline and Hazardous Materials Safety Administration



Examples of difficult-to-access pipeline rights-of-way that make conventional methods impractical/expensive.

### Benefits

This research has advanced pipeline safety by providing pipeline operators with an unprecedented picture of their cathodic protection system coverage.

Detailed benefits include:

- Right-of-way access problems are eliminated
- Data gathering time is reduced
- Manpower required to complete inspections/surveys is drastically reduced
- Reduced HS&E exposure of crews to harsh environments
- 100% coverage of pipeline—no more skipped areas
- Data quality is improved
- Measurements made on simplest leg of CP circuit
- Outside influences are minimized
- Areas prone to corrosion identified before damage occurs
- Integration with other data and GIS system is straightforward

### Future Activities

Baker Hughes PMG and Shell Global Solutions look forward to many years of continued success with this technology. The present fleet of tools is being expanded to include size capabilities from 6" to 30". Refinements of the technology continue as the new service is utilized by more and more operators to inspect pipelines that were previously difficult to assess.

### Partners in Success

- ◆ Shell Global Solutions
- ◆ Baker Hughes Pipeline Management Group [www.bakerhughespmg.com](http://www.bakerhughespmg.com)
- ◆ US Department of Transportation

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